ANDROID | DISASTER RESILIENCE NETWORK

Proceedings

ANDROID Doctoral School in Disaster Resilience 2014

MediaCityUK, Salford Quays, United Kingdom – 8-11 September 2014

4th International Conference on Building Resilience incorporating the
3rd Annual Meeting of the ANDROID Disaster Resilience Network

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Lifelong Learning Programme

This document has been produced with the financial assistance of the European Union. The contents are the sole responsibility of the Network consortium and can under no circumstances be regarded as reflecting the position of the European Union

Proceedings of the

Second

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ISBN 978-1-907842-62-7

Paper 13: Flood risk governance towards resilient communities: opportunities within the implementation of the Floods Directive in Portugal

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ABSTRACT

Flood risk governance is undergoing a step forward with the implementation of the Floods Directive, which extends to all EU member States a standardized approach to assess and manage flood risks, with a strong focus on public participation. This normative document constitutes a considerable development in terms of flood risk policy in Portugal, which should be fully taken as a tool of resilience building.Resilience, however, is a very complex concept which involves the capacity of communities to prepare, adapt and respond to disasters. Whatever the nature of these changes, resilience is present in any risk governance process. After a brief discussion on what practices and policies make a flood resilient community, the goals and methodologies expressed in the Floods Directive, and its Portuguese transposition, are analyzed in the way they contribute or conflict to the goal of achieving more flood resilient communities. A reflexion is made about the consideration of resilience in three important issues of the directive: the risk assessment phase, which culminates in flood risk maps, the management phase to be conducted upon flood risk management plans, and the participation and communication which should be present in all of them.

Keywords: Floods Directive, resilience, risk assessment, risk management, community participation.

INTRODUCTION

Based on the EM-DAT database from 1980 to 2007, estimations are that climate-related disasters will affect[4] about 375 million people in 2015 (Ganeshan & Diamond 2009). In 2012, floods alone were responsible worldwide for 53% of the 139 million people affected by natural disasters, and for an estimated damage of US$ 25.6 billion from a total of US$ 157.5 billions (CRED 2014). Floods, like other natural hazards, are unavoidable but their impacts can be considerably lessened which motivates stakeholders and communities to be more preventive than reactive (Alexander 2012). In general terms, independently of the nature and type of risk - whether natural, social or technological – a preventive *ex-ante* approach is favoured by several factors such as a heightened awareness and acceptance of risk. This is applicable to FRG in Europe where climate change models predict an aggravation of meteorological risks such as floods and storms (Birkmann & von Teichman 2010). The estimated number of affected people shows an increasing trend and decision-makers are realizing that reducing vulnerability is preferable to emergency response (Alexander 2012). A reduction of vulnerability constitutes in fact a condition for increasing resilience. In a broader sense, if a risk governance process doesn't address the social and environmental problems that characterize a given community, then it might fail in developing greater flood resilience. Resilience levels do become evident after a shock

[4]To be affected means to require immediate assistance during a period of emergency, i.e. requiring basic survival needs such as food, water, shelter, sanitation and immediate medical assistance (CRED 2014).

(Figure 1) but this capacity of dealing and recovering from impacts requires a well-developed and executed risk policy that privileges an *ex ante* disaster approach. In fact, the initial condition of a community is something that is built before the hazard event.

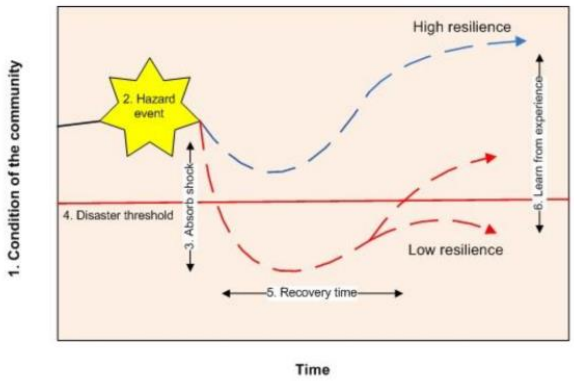

Figure 1 The importance of community resilience in determining the recovery time to a hazard event (Haigh 2010)

The Floods Directive (EU 2007) provides a framework for addressing flooding across Europe. Assuming knowledge, organisation and communication as key resources in risk management (Fothergill, cited in Alexander 2012), this essay attempts to contribute to debates on the role of the Floods Directive and its transposition into the Portuguese legislation, in terms of building more resilient communities. The analysis will be divided in the assessment, management, communication and participation spheres, as they are approached in these two documents.

FLOOD RESILIENT COMMUNITIES

The definition of resilience adopted by the United Nations International Strategy for Disaster Reduction (UNISDR) states that resilience is "the capacity of a system, community orsociety potentially exposed to hazards toadapt, by resisting or changing in order toreach and maintain an acceptable level of functioning and structure" (UN 2005, p. 4).The UNISDR stresses that this capacity is a function of the"degree to which thesocial system is capable of organizing itselfto increase its capacity for learning frompast disasters for better future protectionand to improve risk reduction measures" (UN 2005, p. 4). This concept is wide spread but is not the unique and some authors discuss the readiness for operational use of the different concepts (Gallopin 2006; Klein, Nicholls & Thomalla 2003).

Regarding urban resilience in particular, The World Bank (WB 2013, p. 7) presents a definition similar to the UNISDR, stressing the capability "to prepare for and respond to the risks and impacts". This WB report on the investments of the institution in partner countries regarding disaster risk management and climate change adaptation points out the measures that are part of resilience building: (1) soft measures such as land use and urban planning, community awareness and preparedness, monitoring of hazards and risks, early warning systems, emergency and evacuation plans; (2) hard measures such as retrofitting of critical infrastructure, adapting buildings and urban spaces, managing retreats and relocation and maximization of eco-systems services.

The campaign "Making Cities Resilient" (UN 2014) identifies the characteristics of resilient communities: ability to avoid disasters by improvement of infrastructures, services and building codes; ability to anticipate disaster and protect assets; local government engagement in sustainable urbanization and community participation;

adequate understanding of risks both by local authorities and communities; public participation in the decision-making process, and the local knowledge is valued. As stated by Manyena (2006), it seems consensual that in order to adapt to adverse circumstances, a disaster resilience programme will have to aim at enhancing not only the assets and resources, as well as the understanding about the communities' culture, particularly its "non-essential attributes" (Manyena 2006, p. 439), i.e., those that the community is willing to change in order to adapt and survive.Similarly to other natural hazards – earthquakes, for example – floods can generate disastrous direct and indirect effects whose severity can be even more serious than the direct flooding itself (Messner & Meyer 2006). This fact implies largely that a resilient community to flooding must ideally be a resilient community to hazards in general. Nevertheless, specific characteristics of flood resilience can be found and pursued. In the flood management cycle Schelfaut et al. (2011) highlight that the association of knowledge and awareness is the basis of a flood resilient community.

Community-level flood protection schemes like storage basins, raised river embankments, coastal defences, maintained river channels, floodwalls and barriers can be a first line of hard defence against flooding (Ingirige & Amaratunga 2013), although they intervene more on the flood hazard than on the flood vulnerability dimension. Ingirige and Amaratunga (2013) describe findings from research projects in UK and Bangladesh where non-structural measures for improving flood resilience are pointed out, namely insurance and early warning. Parker, Tunstall & McCarthy (2007) alert for technical, social and institutional aspects that must be accounted for in order to make early warning effective and inclusive of lower social grades. Both studies point out the need for multi-sector and multi-level approaches, for example, in allowing the contingency of socioeconomic routines and by involving non-civil protection actors to assure the effectiveness of evacuation and emergency response operations. Capacity building is also assumed as a critical factor in flood resilience (Ingirige & Amaratunga 2013) – the success of non-structural measures in addressing flood resilience depend on high levels of capacity building because they require multi-stakeholder communication at different geographical scales and decision levels (Schelfaut et al. 2011) along with enhancing perception and risk communication, early warning systems and management plans.

In this brief contribution, it seems clear that flood resilient communities are those supported by FRG policies which assume multi-scale, multi-stakeholder and transdisciplinary approaches as premises for assessing both "constructivist" and "realist" visions of risk (Klinke & Renn 2002). Only upon this wide basis of knowledge, perceptions and inclusion can risk management be effectively conducted.

BUILDING RESILIENCE WITHIN THE FLOODS DIRECTIVE FRAMEWORK

The European Union Directive 2007/60/EC on the assessment and management of flood risks (the Floods Directive) is establishing a new framework for the reduction of their adverse consequences in human health, environment, cultural heritage and economic activity. The framework is organized sequentially in three phases: preliminary flood risk assessment, flood hazard and flood risk mapping and flood risk management. Each phase is subject to a review and update process every six years. The Portuguese transposition of the directive was performed by the Decree-Law 115/2010 of 22 October 2010 (DL 115/2010). FRG was never before performed with such specificity in the Portuguese context making relevant to analyse how the proposed framework deals with the complexity, uncertainty and ambiguity inherent to flood risk,

and how risk-based, precaution-based and discourse-basedmanagement models are considered (Klinke & Renn, 2002). Portuguese literature on this subject is very scarce. The Floods Directive itself is only on its first stages of implementation, this means, flood risk mapping is not yet concluded. Figueiredo et al. (2009) studied flood risk social perception and its degree of incorporation into management mechanisms and found that the "overriding tendency is to underestimate the contribution of social actors in light of technical and scientific views" (p. 597).

The assessment sphere of flood risk governance

Within this sphere the potential to build resilience in a given territory and community lies highly is the last part of the resilience definition provided by the UNISDR, highlighting the importance of "learning from past disasters for better future protection". The absorption capacity mentioned in Figure 1relies also in better knowledge of the flooding historical records and processes, better awareness of potential flood losses and vulnerability and its integration into decision-making.

The preliminary flood risk assessment foreseen in the Floods Directive, and already concluded by the Portuguese government, assumes a precautious attitude by considering "potential risks", i.e., not only areas where flood damages have occurred in the past may be considered, but also areas where flood damages are currently unknown but may potentially occur. Methodologies which categorize the susceptibility of a basin's stream network to flooding (e.g. Reis 2011) as well as geomorphologic analysis play an important role in the identification of such areas. Upon identifying these areas, flood hazard maps are produced for three probability scenarios: low, medium (likely return period $\geq$ 100 years) and high probability. Flood hazard can be assessed through a diversified set of methodologies from which the most used are those based on historical, geomorphologic, hydrological and hydraulic techniques (Díez-Herrero, Laín-Huerta & Llorente-Isidro 2008). What seems to be clear is that a reduction in uncertainty about flood extents and probabilities is achievable when the different approaches are used complementarily to each other (cf. good examples in Benito & Hudson 2010). A positive aspect is the fact that no methodology for hazard mapping is disregarded or made preferable. Santos, Tavares & Andrade (2011) exemplify benefits of using different flood hazard mapping methodologies complementarily, such as a better understanding of the flood processes, with hydrologic and hydraulic methodologies presenting advantages in modelling recent or future changes in the basin and floodplain, while geomorphologic methodologies are advantageous in reliability about longer term planning because they are based in past flooding evidences.

Regarding the vulnerability assessment, the DL 115/2010 details a bit further what is mentioned in the Floods Directive. Both say that risk maps must list the potential adverse consequences associated with the three probability scenarios and identify (i) the indicative number of potentially affected people, (ii) the critical buildings and (iii) the economic activities potentially affected, particularly the critical infrastructures. These items refer exclusively to the identification, by overlay, of exposed elements. The Portuguese transposition only discriminates with more detail these elements, such as contaminant sources, hazardous substances, protected natural areas, lifelines, cultural heritage and areas where a significant solid and debris flow can be expected. A more detailed assessment of social, physical and economic vulnerability would be advisable. Regarding this insufficiency, methodological and conceptual constraints can be found that maintain a technocratic approach in flood risk policy (Jeffers, 2013). The first ones include an excess of confidence in the ability to quantify physical exposure

and the unfamiliarity with vulnerability assessment methods – and its applicability to public policy (Mustafa et al., 2010). Conceptual constraints derive from a biased understanding of flood risk and its causes, which assumes that losses can be eliminated by preventing the flood itself (Jeffers, 2013).

In the Portuguese context, vulnerability assessments are not abundant and the public tendering procedure for the elaboration of flood risk maps prioritizes a quantitative analysis of exposed elements, not vulnerability, of four types: human damages, expressed in terms of affected people; cultural heritage damages; economic damages, calculated in function of land use classes; and environmental damages, based on the presence of the critical and sensitive elements mentioned above. A thorough "understanding of exposure to the hazard, characteristics andpatterns of vulnerability, and the relationshipbetween different stakeholders in the perception offlood risk" (Brown & Damery 2002:424) was presented as valid for the UK, and could be valid for Portugal in the basis for a broader and long-term perspective of FRG.

The management sphere of flood risk governance

Flood risk is under the competency of the Environment Portuguese Agency (APA) as the national water authority. The DL 115/2010 creates a National Commission for Flood Risk Management (CNGRI) in which the APA, the civil protection authority, the cartographic institute and municipalities are represented. In terms of implementation, in February this year, the APA has launched the public tendering procedure for the elaboration of risk flood maps, to be concluded in 5 months but no decision about the winner/s was yet taken. This can constitute a delay in the design and implementation of flood risk management plans (FRMP). According to the directive, FRMP's will be designed for management units where potential risks were previously identified and mapped. Scale of FRMP is an important issue because it implies decisions regarding resource allocation, type and number of involved public and private stakeholders, and strategies of community participation. In Portugal, risk management is essentially based in municipal plans although top-down logic prevails in the policy making and distribution of resources (Tavares & Mendes 2010). Such approach results in lack of attention to local specificities, exemplified by municipalities where flood risk management privileges the main water courses against the flash and urban floods that occur in smaller streams, but whose impact is also relevant due to its frequency, unpredictability, human and material losses. As it was demonstrated in Sultana, Thompson & Green (2008) research, an institutional building following a bottom-up approach, i.e., from the settlement to the catchment scale, might allow a better achievement of the Floods Directive objectives.

From a sector and actors' perspective, the Floods Directive states that FRMP's must consider aspects such as"(...) costs and benefits, flood extent and floodconveyance routes and areas which have the potential toretain flood water, such as natural floodplains, the environmental objectives of Article 4 of Directive 2000/60/EC, soiland water management, spatial planning, land use, natureconservation, navigation and port infrastructure" (cf. Article 7(3)). Such articulation is resumed for the Portuguese context in Figure 2. Inside the Portuguese legal framework for spatial planning, FRMP's are classified as sector plans (cf. Article 12 of DL 115/2010). With this status, they must be in accordance with the top management instrument, the National Program for the Spatial Planning Policies (PNPOT), from which FRMP's receive primary guidance and with regional plans for spatial planning (PROT).

Hydrographical Basin Plans (PBH), some of them under revision, must be in "close articulation" with FRMP, and their chapters on flood risk assessment must "respect the criteria and goals" of the DL115/2010. Regarding local and special spatial planning instruments (PMOT and PEOT), they must adapt to the content and guidelines in vigor under FRMP's. This is also applicable to the Ecological National Reserve (REN), a special legal figure to protect ecological values at the national scale, which must be altered in function of what is established in FRMP's. The preamble of the DL 115/2010 says that FRMP's must "take into account the characteristics of the zones to which they refer and predict specific solutions for each case" as well as consider what is disposed in the emergency planning instruments (PEPC). The Article 12(3) clarifies that PEPC shall "warranty the due compatibility with FRMP's" so the relation is two-sided. Finally, the dispositions of the DL 115/2010 don't prejudice the dispositions of the DL 364/98 – this decree-law obliges municipalities with historical records of flooding in urban areas to elaborate flood hazard maps with the objective of defining restrictive land uses. The revocation of the DL 364/98 is not foreseen, although it could be – particularly after the completion of the FRMP's – for the following reasons: the flooded areas delineated upon the DL 364/98 will naturally be included in the Floods Directive preliminary assessment, and consequentially, in FRMP's; not revoking will create duplication and/or contradictions between risk management measures defined in both documents; risk classifications and assessment methodologies may not concord in several situations raising ambiguous interpretations of the same realities.

The introduction of the concept of "deliberate over-flooding" is foreseen in the Floods Directive which is an innovative measure in the Portuguese context, although experiences already exist in some European countries (Erdlenbruch et al. 2009). Deliberate over-flooding consists in deliberately causing flooding in upstream areas – for example, deriving flow to natural storage areas – in order to reduce and delay the peak flow in downstream areas. This practice allows transfer risk from areas downstream (e.g. urban settlements) to less vulnerable areas upstream. Financial compensatory measures can be defined to make this practice appealing to over-flooded areas. If well designed and implemented – technically, socially and financially – this practice can become an important measure in increasing flood resilience.

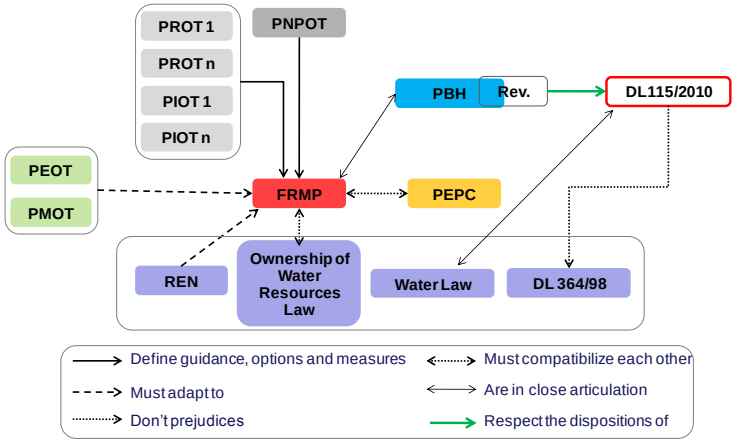

Figure 2 Articulation of the FRMP according to the Portuguese transposition of the Floods Directive.

More clearly than the Floods Directive (cf. Article 7(3)), the Portuguese transposition privileges the option for non-structural measures of risk reduction in FRMP's. Integration of flood risk management with other sector planning instruments is one of the possible ways to pursue this preference, taking advantage of the potential synergies.

It is therefore positive that the Floods Directive refers the need of integrating strategies with the Directive 2000/60/EC (Water Framework Directive) and with spatial planning instruments. The methodological findings of research projects such as the STAR-FLOOD (Hegger et al. 2013) and the CRUE-ERAnet (e.g. Jobstl et al. 2011) in what concerns the selection, monitoring and evaluation of flood risk structural and non-structural measures can provide useful insights for FRMP's.

The Portuguese context of flood risk management may present differences from that of other European regions. The separation between water and people that is observed in some European countries caused by heavy structural measures (e.g. Kelman & Rauken, 2012 and Jeffers, 2011) has not occurred in Portugal. The countries studied in the STAR-FLOOD project present, until recently, a technologically oriented approach to flood management (Hegger et al. 2013) while this may not be the case in Portugal, or at least with the same magnitude. In fact, dams and stream channelization do exist in a few basins but a comparison of their role and the role of non-structural measures in reducing flood damages – particularly spatial planning – are still to be thoroughly assessed. The two opinions on FRMP's that municipal authorities present in Germany (Heintz, Hagemeier-Klose & Wagner 2012) – one holistic, which combines structural and non-structural measures upon a risk governance approach, and another which maintains a focus on local, short-term solutions marked by a security approach – are also present in Portugal, perhaps more evident about coastal than fluvial floods. Regarding this later type of floods, although the lack of research in this area, it seems plausible to think that the role of local administrators in the fields of spatial planning and civil protection, along with the scarcity of financial resources for structural defenses, can justify the minor relevance of structural solutions in Portugal.

Participation and communication in the Floods Directive

If the process of gathering knowledge about flood risk was conducted with participation of stakeholders and communities, its management should also be carried out in a participatory way. This aspect is given top relevance in the Portuguese transposition of the Floods Directive, where Article 14(2) elaborates that FRMP's elaboration, re-assessment and updating must be conducted with the "active participation of all interested parts". It is, therefore, pertinent to envisage how this participation can be planned and put to practice with the public and private sector.

The model of cooperative discourse (Aven & Renn 2010) has the advantage of incorporating several mechanisms of participation and encouraging mutual learning. It is marked by great versatility in coping with the plurality of knowledge and values at stake in FRG, namely, the proposal of different participation tools according to the type of risk. When risks are marked with high complexity, epistemic tools are more adequate in order to deal with scientific and technical expertise. Examples of tools consist in expert auditions or Delphi and Group Delphi dynamics. When risks are marked with high uncertainty – equity and sharing of costs and benefits are in discussion – reflective discourse instruments such as stakeholders' auditions, round tables, and mediation and arbitration dialogues are suggested. When ambiguity is prevalent in decision-making – values, social or moral justification are in discussion - a participatory discourse is present, and the adequate instruments of participation include citizen panels or juries, public consensus conferences or citizen actions groups. If one looks, for example, at the "deliberate over-flooding" practice, it's easily recognizable the relevance in applying all of the three types of discourses given the technical-scientific complexity, potential conflicts of interest and values at stake (cultural, ecological, etc.).

Risk communication is an important part of community involvement. Effective risk communication promotes a risk culture and leads to greater opening and easiness in reaching agreements on management strategies. Risk communication should be tailored to the specific needs of the population, giving each individual the opportunity to judge for them the level of risk which he/she is facing and to make his/her own decisions on the measures of protection and preparedness (Kellens et al. 2009). Maps, as communication tools, play a crucial role in flood risk communication. The three flood probability scenarios foreseen in Article 7 of DL 115/2010 shall be clearly explained, particularly, given the difficulty in conceptualizing the low probability and highly burdensome flood events (Keller , Siegrist & Gutscher 2006), for which the conceptual model of risk map developed under the RISKCATCH project (Spachinger et al. 2008) could be useful. FRMP's shall ponder other communication tools such as WebGIS and their ability to include real time data and population warnings. The creation of a national flood early warning system (cf. Article 11 of DL 115/2010) is a positive aspect of the transposition. The system already existed and provides real time data on rain, flow and dam level in the main Portuguese basins.

CONCLUSIONS

The presented essay argues that the process of building flood resilience begins with the capacity of generating better knowledge about the hazard itself and its consequences upon vulnerable communities. The increase in the capacity of systems to prepare, adapt and respond to hazards starts with a thorough assessment of flood risk and knowledge transfer, as basis for an efficient management. Building resilience specifically to flood risk contributes to a general improvement of resilience to other risks. The transposition of the Floods Directive into Portugal resulted in a robust document in its goals and potential lines of action, and consequently, with a range to decisively contribute to reduce flood losses. Nevertheless, some issues still need to be further studied: participative models in the several phases of the FRMP; financing mechanisms; articulation with other sector planning instruments; and goals and methodologies for performing cost-benefit analysis and monitoring.

An important aspect of community's participation in the process of risk management consists in finding a balance between an essentially sociological view and a vision focused in the physical processes of the hazard – summarized by Klinke & Renn (2002) as "realism" versus "constructivism". As to FRG, it is assumed that the dynamic nature of the risk requires an equally dynamic strategy of management. The elaboration of FRMP should incorporate this principle, focusing on both bio geophysical and socioeconomic specificities of the different hydrographic management units. Methodologies for assessing risk tolerability and regulatory strategies as ALARA ("as low as reasonably achievable") or BACT ("best available control technology") may be beneficial. Methodologies for evaluating resilience (Cutter, Burton & Emrich 2010) could also be included. Dealing with the biophysical and engineering aspects of flooding and the institutional and social landscape of risk management is perhaps one of the greatest challenges to the best application of the Directive. The Floods Directive assumes a simple but relevant step forward in FRG – the assumption that floods are "natural phenomena which cannot be prevented" (EU 2007: preamble (2)), but their impacts can be reduced and mitigated, and their aftermath better overcome. Considering its goals and provisions, the Floods Directive is capable of contributing to build more resilient communities.

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